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Press release

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STMicroelectronics to Supply Advanced Silicon-Carbide Power Electronics to Renault-Nissan-Mitsubishi for High-Speed Battery Charging in Next-Generation Electric Vehicles

- *Silicon carbide (SiC) is a very high-performance power-semiconductor technology, offering exciting prospects for smart, sustainable mobility*
- *High energy efficiency, temperature performance, reliability, and the small size of ST's SiC components make EVs even more attractive*

Geneva, September 9, 2019 – STMicroelectronics (NYSE: STM), a global semiconductor leader serving customers across the spectrum of electronics applications, has been chosen to supply high-efficiency silicon-carbide (SiC) power electronics by Renault-Nissan-Mitsubishi (Alliance) for advanced on-board chargers (OBCs) in its upcoming electric vehicles.

Renault-Nissan-Mitsubishi plans to use the new SiC power technology to build more efficient and compact high-power OBCs that will further increase attractiveness of electric vehicles for the users by cutting battery-charging time and enhancing driving range. As Renault-Nissan-Mitsubishi's chosen partner for advanced SiC technology, ST will provide design-in support to help maximize OBC performance and reliability.

ST is also to supply Renault-Nissan-Mitsubishi with associated components, including standard silicon devices. The OBCs with ST's SiC are scheduled to enter volume production in 2021.

"As the pioneer and global leader in zero-emission electric vehicles, our objective remains to be the number one provider of mainstream mass-market and affordable EVs around the world," said Philippe Schulz, Alliance VP Design Electric & Hybrid Powertrain**.** *"The small size, light weight, and high energy efficiency we can achieve using ST's SiC technology in our OBC, combined with the increased battery efficiency, will enable us to accelerate the adoption of electric vehicles by reducing charging times and extend the range of our EVs."*

Marco Cassis, President, Sales, Marketing, Communications and Strategy Development, STMicroelectronics, said, *"SiC technology can help the world by*

reducing dependence on fossil fuels and increasing energy efficiency. ST has successfully developed manufacturing processes and established a portfolio of qualified, commercialized SiC products also in automotive-grade version. Building on our long cooperation, we are now working with Renault-Nissan-Mitsubishi to realize the many advantages SiC can bring to EVs. Moreover, this commitment helps ensure success by increasing the economies of scale to deliver superior-performing SiC-based circuits and systems that are also cost-effective and affordable."

Further Technical Information:

On-Board Charging

EVs need an OBC to handle charging from standard roadside charge points, when a dedicated home-charging system or super-charger is not available. The time to recharge is determined by the OBC power rating and the units in today's EVs have ratings between about 3kW and 9kW.

As the leading EV brand, Renault-Nissan-Mitsubishi has already created a 22kW OBC for the Renault Zoe model, which can fully recharge the battery in about one hour. Now, by upgrading the OBC to leverage the superior efficiency and small size of ST's SiC power semiconductors (MOSFETs and rectifier diodes), Renault-Nissan-Mitsubishi can further reduce the size, weight, and cost while increasing energy efficiency to make future models even more attractive for users and beneficial for the environment. The new, compact, and high-power OBC gives designers more freedom to style the vehicle and optimize packaging, weight distribution, and vehicle drivability.

Silicon-Carbide (SiC) Technology

SiC is a proven power-semiconductor technology that enables highly efficient power switches (MOSFETs) and rectifiers (diodes) and is backed by trusted reliability data. In engineering terms, SiC is a wide bandgap (WBG) semiconductor material that works at higher frequencies, can withstand higher operating temperatures, and with smaller form factors than traditional Silicon-based materials. These advantages give component designers superior control over device characteristics, better optimizing the balance among physical dimensions, MOSFET on-resistance ($R_{DS(ON)}$), diode forward voltage (V_F), and factors such as capacitance and gate charge that affect turn-on/off or reverse-recovery times and the energy dissipated when switching. Compared to conventional silicon, WBG semiconductors can withstand higher applied voltages in relation to device size, which allows lightweight components to be extremely rugged as well as highly energy-efficient.

In addition to automotive uses like OBCs, ST's SiC MOSFETs and rectifiers are also widely used for power conditioning and conversion in the renewable-energy sector, and in other equipment such as industrial automation, high-voltage DC distribution,

data-center power supplies, and smart lighting, where maximizing energy efficiency is the overriding demand.

About STMicroelectronics

ST is a global semiconductor leader delivering intelligent and energy-efficient products and solutions that power the electronics at the heart of everyday life. ST's products are found everywhere today, and together with our customers, we are enabling smarter driving and smarter factories, cities and homes, along with the next generation of mobile and Internet of Things devices.

By getting more from technology to get more from life, ST stands for life. Augmented.

In 2018, the Company's net revenues were $9.66 billion, serving more than 100,000 customers worldwide.

Further information can be found at www.st.com

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